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## **Observation of Underwater Pulse Discharge and Influence of Deposited Energy on Shock Wave**

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The shock wave generated by underwater pulse discharge has been used in many industrial applications such as electrohydraulic forming, oil stimulation and rock fragmentation. From an industrial point of view, how to achieve high electrohydraulic transformation efficiency is one of the main focus. To solve this problem, the comprehensive understanding of the sophisticated phenomenon is required.

In this paper, an optical observation system for underwater pulse discharge system is established to study the shape variation and the movement of arc and bubble. Needle to needle electrodes are used in experiments, of which the discharge gap length is from 10 mm to 25 mm. The charge voltage of the main capacitor (3 $\mu$ F) is 30 kV. A fast camera (FASTCAM SA-X) with multiple ND flitters (ND 1000 + ND 400) is equipped to capture the shape variation and the movement of arc and bubble. The arc voltage, current and the pressure of the shock wave are acquired by Tektronix P6015A, PEM CWT600 and PCB 138A01 respectively, all signals are stored in a 350MHz oscilloscope (Agilent HD4034). The method of calculating deposited energy and average arc resistance is proposed as well, in which the time variation characteristic of the arc is taken into consideration. Finally, the influence of deposited energy on shock wave is analyzed.

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